

RESEARCH PAPER

Analysis of the psychometric properties of the portuguese version of an eHealth literacy assessment tool

Análise das propriedades psicométricas da versão portuguesa de um instrumento de avaliação de e-Literacia em Saúde

Análisis de las propiedades psicométricas de la versión portuguesa de un instrumento para evaluar la alfabetización digital en salud

Catarina Cardoso Tomás*; Paulo Joaquim Pina Queirós**; Teresa de Jesus Rodrigues Ferreira ***

Abstract

Background: Electronic information sources play a key role in health information contexts and are privileged resources for the entire population, particularly for adolescents.

Aims: To validate the eHealth Literacy Scale for the Portuguese population; and to identify the levels of eHealth literacy among adolescents, as well as the association between these levels and socio-demographic variables.

Methodology: A quantitative, descriptive-correlational, retrospective and cross-sectional study was conducted using a non-probability sample of 1215 adolescents.

Results: The scale showed good internal consistency and mostly moderate, statistically significant inter-item correlations. Gender differences were found in some items. Moreover, adolescents in higher grade levels reported being unaware of where to find health resources on the internet when compared to those in lower grade levels.

Conclusion: This sample of adolescents showed good levels of eHealth literacy. Including eHealth literacy promotion programs in the high school curriculum will allow young people to acquire the necessary skills required for an informed decision making and promote their health in the future.

Keywords: health literacy; internet; adolescent.

Resumo

Contexto: As fontes de informação eletrônica assumem um papel primordial nos contextos de informação em saúde, tornando-se fontes privilegiadas para toda a população, sobretudo adolescentes.

Objetivos: Validar a *eHealth Literacy Scale* para a população portuguesa; conhecer os níveis de e-literacia eletrônica nos adolescentes, bem como a sua relação com variáveis sociodemográficas.

Metodologia: Foi realizado um estudo quantitativo, descritivo-correlacional, retrospectivo e transversal, utilizando uma amostra não probabilística de 1215 adolescentes.

Resultados: A escala apresenta bons valores de consistência interna, bem como correlação entre todos os itens, maioritariamente moderada e estatisticamente muito significativa. Foram encontradas diferenças nalguns itens entre rapazes e raparigas. Adolescentes em anos de escolaridade mais avançados reconheceram não saber onde encontrar recursos sobre saúde na *internet*, em relação aos que frequentam níveis de escolaridade inferior.

Conclusão: Os adolescentes da amostra apresentam bons níveis de e-literacia em saúde. Incluir o desenvolvimento desta literacia nos programas de saúde escolar, permitirá aos jovens adquirir as competências necessárias para uma boa tomada de decisão e promover a saúde no futuro.

Palavras-chave: literacia em saúde; internet; adolescente.

Resumen

Contexto: Las fuentes de información electrónica asumen un papel fundamental en los contextos de información sobre la salud y representan fuentes privilegiadas para toda la población, especialmente adolescentes.

Objetivos: Validar la *eHealth Literacy Scale* para la población portuguesa; conocer los niveles de alfabetización digital de los adolescentes, así como su relación con variables sociodemográficas.

Metodología: Se realizó un análisis cuantitativo, descriptivo-correlacional, retrospectivo y transversal, para el cual se utilizó una muestra no probabilística de 1.215 adolescentes.

Resultados: La escala presentó buena consistencia interna y una correlación entre todos los ítems, en su mayoría, moderada y estadísticamente muy significativa. Se encontraron algunas diferencias en ciertos ítems entre chicos y chicas. Los adolescentes en años de escolaridad más avanzados, en relación con aquellos de niveles escolares inferiores, reconocieron no saber dónde encontrar recursos sobre la salud en Internet.

Conclusión: Los adolescentes de la muestra presentan un buen nivel de alfabetización digital en salud. La inclusión del desarrollo de esta alfabetización en los programas de salud escolar permitirá a los jóvenes y la adquisición de las competencias necesarias para una adecuada toma de decisiones en salud e promoción de la salud en el futuro.

Palabras clave: alfabetización en salud; internet; adolescente

* Bachelor in Nursing and Occupational Safety Engineering, Specialist in Mental Health and Psychiatric Nursing. Master student in Mental Health and Psychiatric Nursing at the School of Health Sciences of the Polytechnic Institute of Leiria. Ph.D. student in Nursing Science at the Institute of Biomedical Sciences Abel Salazar of the University of Porto, 2nd triennium Assistant, Polytechnic Institute of Leiria, School of Health Sciences, Department of Nursing Science, 2411-901, Leiria, Portugal [Catarina.cardosot@gmail.com]. Address for Correspondence: Rua Paulo VI, Lote 44, N.º 23-B, 5.º, 2410-149 Leiria

** Post-doctoral student at the ICBAS-UP. Ph.D. in Psychological Development and Intervention. Master in Occupational Health. Bachelor in History and in Rehabilitation Nursing. Coordinating Professor, Nursing School of Coimbra, Department of Nursing, 3046-851, Coimbra, Portugal [pauloqueiros@esenf.pt].

*** Ph.D. in Psychology. Coordinating Professor, Porto Nursing College, Department of Nursing, 4200-072, Porto, Portugal [teresarodrigues@esenf.pt].

Received for publication: 10.01.14

Accepted for publication: 20.05.14

Introduction

Health is a domain in which it is essential to have an adequate level of literacy. Having appropriate literacy levels and skills to process, understand, and be able to make appropriate decisions with health information might mean the difference, for example, between taking a recommended or fatal dosage of medication or between adhering or not to the advices of health technicians (Bodie & Dutta, 2008). Despite the proliferation of health information websites, or eHealth, much health information remains inaccessible to a large percentage of the population due to low levels of health literacy and computer skills (Robinson & Graham, 2010).

Moreover, eHealth literacy requires that people are able to seek out, find, evaluate and appraise, integrate, and apply what is gained in electronic environments toward solving a health problem. This composite skill requires that people are able to work with new technology, critically think about issues of media and science, and navigate through a vast array of information tools and sources to acquire the information necessary to make decisions (Norman & Skinner, 2006a, 2006b).

According to the Lily's Model, which was used to design the eHealth Literacy Scale, eHealth literacy is comprised of six core skills, or literacies, that always operate in an interactive network when carrying out eHealth tasks (such as finding health information or monitoring health status) using a technological tool (Chan, Matthews, & Kaufman, 2009). Three of them (functional literacy, information literacy and media literacy) are analytic, and are applicable to a broad range of information sources irrespective of the topic or context. The others (health literacy, scientific literacy and computer literacy) are context-specific skills, and are, in particular, related to the circumstances in which the information is sought (equipment used and search conditions), type of information presented (scientific or not) and searched issues, in this case health issues (Norman & Skinner, 2006a, 2006b).

The main objective of this study was to assess the psychometric properties of an instrument to assess eHealth literacy in Portuguese adolescents: the eHealth Literacy Scale of Norman and Skinner (2006a). This study also aimed to assess the levels of eHealth literacy in adolescents, as well as to identify

the association between the levels of eHealth literacy and adolescents' gender, age and grade level.

Background

Health literacy has been identified as a public health goal for the 21st century, highlighting the need to look at the different contexts where health information is obtained and used as part of a strategy of addressing health literacy. More than ever, health information contexts include electronic resources such as the Internet and other technologies that play an increasing role in consumer's health (Austin, 2012; Norman & Skinner, 2006a; Stollefson et al., 2011), thus becoming privileged sources of information for the general population. Also in Portugal, this source of information is considered a strategic resource for almost half of the population, with particular emphasis on adolescents and young adults (Ministério da Saúde. Direção Geral de Saúde, 2012). These sources of health information have the potential to empower people, enabling them to make informed decisions, as well providing them with opportunities to manage their own health status (Austin, 2012).

Several authors have suggested the integration of the internet into school-based intervention programmes addressing health as a way of providing opportunities for young people to develop their health literacy skills, particularly by educating them to search for and select electronic information sources (Ghaddar, Valerio, Garcia, & Hansen, 2012; Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005). It is imperative to stimulate the search for accurate and appropriate information for young people based on school programs developed in partnership with health institutions and aimed at the promotion of health literacy skills, namely the search for online health information (Gray et al., 2005). Including health literacy as an objective in school health programmes is paramount, because acquiring this skill, as well as promoting healthy behaviours, enables young people to obtain, assess, and apply health information successfully, making this type of programs more effective in terms of objectives (Loureiro et al., 2012). In the National Health Plan, the promotion of literacy is also considered as strategy which should be adopted to improve the levels of health in the general population (Ministério da Saúde. Direção Geral de Saúde, 2012).

The development of this type of abilities in adolescence is crucial, because they will allow adolescents to make informed and relevant health decisions in the future (Paek & Hove, 2012). Investing in this training allows not only empowering young people and providing them with skills to improve their health decisions in the present, but also making them more conscientious and informed users of health care services. Thus, they will be able to make a more valuable use of these services, properly using health information in the future, and increasing their confidence in the process of selection and use of this information (Ghaddar et al., 2012).

Despite frequently using these technologies, some issues arose concerning the quality of their access to the internet, with this group experiencing some difficulties in understanding or using health information available online (Gray et al., 2005; Norman & Skinner, 2006a).

With the purpose of identifying adolescents' perceptions and experiences regarding the use of the internet for online health information, Gray et al. (2005) conducted a qualitative study in the United States and the United Kingdom, based on 26 focus groups, composed of male and female adolescents aged 11 to 19 years. They concluded that young people often have difficulties in accessing adequate health information simply because they cannot spell or write medical terms correctly. Young people suggested that an online dictionary of medical terms could help them overcome this difficulty. The information is often available, but adolescents do not understand its meaning.

Despite the ample access to the Internet and electronic information sources, young people are still talking about a deficit of skills to search for valid and reliable health information, as well as to assess that information (Stellefson et al., 2011).

Another obstacle identified by young people concerns the selection of trusted sites with the necessary information, in view of the large number of records retrieved when a word or topic is searched for in a search engine. Young people consider the sites with reliable information and those with personal opinions and accounts as important; however, they should clearly identify the type of information, as well as be of easy access for adolescents of different ages (Gray et al., 2005).

The young people reported that the information they seek and find on the internet has already allowed them to modify and improve some behaviours, in particular in relation to their eating habits (healthier and balanced diets) and physical exercise, as well as reduce risk behaviours, such as the use of substances that enhance physical and intellectual performance. The adolescents reported that they generally search the Internet as a first attempt to collect information about a given topic, and that then they will find the help of a health professional if they deem it necessary (Gray et al., 2005).

Several studies have already been carried out in several countries to measure the levels of adolescents' eHealth literacy, using for this purpose the eHealth Literacy Scale (eHEALS).

This scale was designed in 2006 by Norman and Skinner (Norman & Skinner, 2006a) with the purpose of assessing eHealth literacy in a large segment of the population and in different contexts. It is a self-report tool that can be administered by a health professional and is based on an individual's perception of her or his own skills and knowledge within each measured domain related to eHealth literacy. It is composed of 8 items, with two additional items which, although they are not part of the scale, complement the information (items 1 and 2). Its score ranges from 1 to 5 and the higher the score, the higher the levels of eHealth literacy. This instrument was designed to generally assess the eHealth skills of the population, and this information can be used to implement individual or collective health promotion programmes (Norman & Skinner, 2006a).

A study conducted by Norman and Skinner (2006a), authors of the scale, allowed to understand the levels of eHealth literacy of Canadian adolescents. A total of 664 female and male adolescents, aged 13 to 21, attending grades 9, 10 and 11 in 14 secondary schools in a Canadian city were sampled. Levels of eHealth literacy were higher among males ($t_{726}=2.236$, $p=0.026$). In addition, no statistically significant differences were detected in eHealth literacy levels according to the participants' age and the forms of information technology used (WWW, TV, instant messaging, email, pager, or mobile phone). Moreover, eHealth literacy levels were not related to self-evaluations of the health status and were not a significant predictor of perceived health status over time in this sample (Norman & Skinner, 2006a).

A study conducted with 182 sixth, seventh, and eighth graders in the state of Michigan, USA, assessed eHealth literacy in an intervention aimed at its promotion. The sample showed a mean score of eHealth literacy of 3.51 ($=0.60$). After the implementation of a 3-session eHealth literacy promotion programme, the mean score rose to 3.62 ($=0.65$). Young people in higher grade levels showed higher levels of eHealth literacy (Hove, Paek, & Isaacson, 2011; Paek & Hove, 2012).

Ghaddar et al. (2012) conducted a study in a school cluster (South Texas Independent School District), which included five schools, two of which with training in the health area. A sample of 261 students, aged 14-20, and attending grades 9 to 12 was used. Of these, 58% attended schools with health training. The sample includes both male and female adolescents, with most of them being Hispanic (86%). eHealth literacy was assessed using the eHealth Literacy Scale, and adequate levels of eHealth literacy were found (mean score of 3.83). Despite this, 7% had a possibility of limited literacy. Higher levels of eHealth literacy were found in individuals attending schools with health training, and, in a general way, in adolescents in higher grade levels.

In Europe, a study conducted in the Netherlands, using a stratified sample of 88 participants from the region of Twente, as well as the eHEALS, showed that participants had an average level of eHealth literacy of 3.45 ($=0.74$). The levels of eHealth literacy found in this study decrease with age and increase with the educational level of the participants. Despite this, these differences are not statistically significant. There seems to be a statistically significant positive correlation regarding the number of hours spent on the internet per day, suggesting a positive influence of the amount of time spent on the Internet on eHealth literacy (Drossaert, Van Der Vaart, & Van Deursen, 2011).

Health literacy skills should be developed as a way to maximize the benefits of the availability of health information on the internet (Gray et al., 2005).

As young people improve these skills, their trust in commercial and brand Web sites as a source of health information decreases, even if that information is reliable (Hove et al., 2011). This trust decreases because one of eHealth literacy skills is to distinguish persuasive sources of information from informational and educational sources (Hove et al, 2011).

Research questions

This study aimed to answer the following question: What are the levels of eHealth literacy in the sample of adolescents and its relation to gender, age and grade levels of these adolescents?

To this end, several sub-questions were formulated: What are adolescents' eHealth literacy levels?; Are there any gender differences in eHealth literacy levels?; Are there any differences in eHealth literacy levels according to adolescents' age?; Are there any differences in eHealth literacy levels among adolescents attending different grade levels?

Methodology

To answer the research questions and the study objectives, a 8-item scale with a 5-point Likert scale and response options ranging from *strongly agree* to *strongly disagree* (scores between 1 and 5) was used. The instrument includes two supplementary items to understand respondents' interest in using eHealth. These items are also scored on a Likert type scale, with five response options from *Not useful at all* to *Very useful* (scores between 1 and 5). Higher scores correspond to higher levels of eHealth literacy.

A cross-cultural validation methodology was used which was adapted from the methodology presented by Sousa and Rojjanasrirat (2010) for the translation and validation of the *eHealth Literacy Scale* for the Portuguese population. Figure 1 shows the different stages of this process.

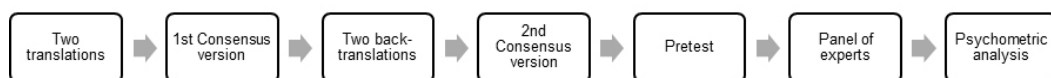


Figure 1. Process of cultural translation and validation of the scale

After the process of translation and cultural validation, the psychometric analysis was conducted in a quantitative, descriptive-correlational, retrospective and cross-sectional study.

With the target population being the adolescents attending Secondary Education (10th, 11th and 12th grades) in the district of Leiria, and using a convenience nonprobability sampling method, 1215 adolescents attending two secondary were sampled. The following inclusion criteria were defined: adolescents attending one of the two secondary schools in the district of Leiria who agreed to participate in the study. The students who refused to participate in the study or those without permission from their parents/tutors to participate were excluded.

Data were collected using a self-report questionnaire, including socio-demographic questions (so as to assess the variables of age, gender, grade level) and the eHealth Literacy Scale (so as to assess the variable of eHealth literacy), duly translated and culturally adapted to the Portuguese population. Throughout the research process, all formal and ethical procedures were respected. Permission was obtained from the Directorate-General for Innovation and Curricular Development (DGIDC) of the Directorate-General for Education to conduct the study. For the psychometric analysis of the scale, statistical procedures similar

to those used by Norman and Skinner (2006a) were used, in particular the analysis of the internal consistency using Cronbach's *Alpha*, the inter-item correlation (Pearson's test) and the confirmatory and exploratory factor analysis. All statistical analyses and tests used a maximum allowable probability of making a Type I Error of 0.05.

Results

The sample consisted of 1215 individuals: 643 (52.92%) males and 572 (47.08%) females. Participants' age ranged from 14 to 22 years, with a mean of 16.32 years and a mode of 16 years (34.32%). In relation to the school year, 35.14% (427) of the participants attended 10th grade, 38.60% (469) attended 11th grade and 26.26% (319) attended the 12th grade.

Various analyses were performed to validate the scale. Mostly moderate and highly statistically significant inter-item correlations were found ($p \leq 0.01$), which means that the questions in the instrument are correlated, though not redundant. As seen in Table 1, the lowest correlation score found was $r=0.123$ between items 2 and 9, while the highest correlation score ($r= 0.682$) was found between items 4 and 5, which shows there are moderate correlations.

Table 1
Pearson's correlations between the items of the scale

		Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Item 2	<i>r</i>	0.596								
	<i>p</i>	0.000**								
Item 3	<i>r</i>	0.350	0.339							
	<i>p</i>	0.000**	0.000**							
Item 4	<i>r</i>	0.326	0.275	0.566						
	<i>p</i>	0.000**	0.000**	0.000**						
Item 5	<i>r</i>	0.348	0.317	0.505	0.682					
	<i>p</i>	0.000**	0.000**	0.000**	0.000**					
Item 6	<i>r</i>	0.339	0.303	0.355	0.472	0.564				
	<i>p</i>	0.000**	0.000**	0.000**	0.000**	0.000**				
Item 7	<i>r</i>	0.337	0.323	0.320	0.354	0.436	0.456			
	<i>p</i>	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**			
Item 8	<i>r</i>	0.231	0.195	0.342	0.348	0.322	0.301	0.471		
	<i>p</i>	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**		
Item 9	<i>r</i>	0.155	0.123	0.308	0.314	0.292	0.273	0.335	0.505	
	<i>p</i>	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	
Item 10	<i>r</i>	0.432	0.334	0.387	0.382	0.388	0.390	0.436	0.363	0.349
	<i>p</i>	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**

* $p \leq 0.05$; ** $p \leq 0.01$

The internal consistency of the scale was assessed using Cronbach's Alpha. The total Cronbach's Alpha for the 10 items was 0.853, but only for the 8 items it

was 0.842. When one of the 8 items was deleted from the scale, the Cronbach's Alpha of the scale ranged from 0.811 to 0.834 (Table 2).

Table 2
Internal consistency if items deleted

	<i>Cronbach's Alpha</i> if item deleted
Item 3 - I know what health resources are available on the Internet.	0.822
Item 4 - I know where to find helpful health resources on the Internet.	0.813
Item 5 - I know how to find helpful health resources on the Internet.	0.811
Item 6 - I know how to use the Internet to answer my questions about health.	0.822
Item 7 - I know how to use the health information I find on the Internet to help me.	0.822
Item 8 - I have the skills I need to evaluate the health resources I find on the Internet.	0.826
Item 9 - I can tell high quality health resources from low quality health resources on the Internet.	0.834
Item 10 - I feel confident in using information from the Internet to make health decisions.	0.826

The scale's internal consistency was analysed using the Guttman Split-Half Coefficient, and it was observed that both parts of the scale (each composed of 4 items) had Cronbach's Alpha of 0.814 and 0.731, respectively, and a total Guttman Split-Half Coefficient of 0.738. The Kaiser-Meyer-Olkin (0.8) test and the Bartlett's test of sphericity ($\chi^2 = 3392.203$; $df=28$; $p\leq 0.001$) showed that the criteria for factor analysis were fulfilled. In line with the original scale's authors who considered a single dimension, (with $\alpha=0.88$; 44.79% of the variance explained), a single-factor

confirmatory factor analysis was performed using the principal components analysis without rotation. The percent of variance explained was 47.803%, with components ranging from 0.587 to 0.798. However, an exploratory factor analysis with Varimax rotation was also performed (Table 3), showing that two factors explained 60.94% of the total variance: the first factor included items 3, 4, 5 and 6 and explained 34.33% of the variance, and a second factor with items 7, 8, 9 and 10 explained 26.6% of the variance.

Table 3
Factor Analysis and factor loading after Varimax rotation

Items	1st Factor	2nd Factor
3	0.689	
4	0.829	
5	0.851	
6	0.690	
7		0.607
8		0.819
9		0.790
10		0.524
% of variance explained	34.338	26.604

It should also be mentioned that in the 2-factor solution, Cronbach's Alpha values for each factor was 0.814 and 0.731, respectively. Table 4 shows that the mean scores obtained in each item (including items 1 and 2 that are not part of the scale, but which were included in the instrument)

ranged from 2.884 in item 10 "I feel confident in using information from the Internet to make health decisions." to 4.010 in item 2 "How important is it for you to be able to access health resources on the Internet?".

Table 4
Levels of eHealth literacy in the sample

	Minimum	Maximum	\bar{x}	σ
Item 1	1	5	3.723	0.8806
Item 2	1	5	4.010	0.8046
Item 3	1	5	3.337	0.8153
Item 4	1	5	3.484	0.8492
Item 5	1	5	3.655	0.8110
Item 6	1	5	3.708	0.8578
Item 7	1	5	3.589	0.7722
Item 8	1	5	3.440	0.8215
Item 9	1	5	3.555	0.9013
Item 10	1	5	2.884	0.9329
Total Scale	1	5	3.4563	0.58200

Statistically significant differences were found ($p \leq 0.01$) between female and male participants (Table 5), namely in item 2 *How important is it for you to be able to access health resources on the Internet?* (higher among females), item 9 *I can tell high quality health resources from low quality*

health resources on the Internet. and item 10 *I feel confident in using information from the Internet to make health decisions.* (higher among males). No statistically significant differences were found ($p > 0.05$) between females and males regarding the level of eHealth literacy (total scale).

Table 5
Gender differences in eHealth literacy (Student's t-test)

	Gender	\bar{x}	σ	F	$F(p)$	t	p
Item 1	Male	3.709	0.8888	1.242	0.265	-0.578	0.563
	Female	3.739	0.8719				
Item 2	Male	3.932	0.8326	4.323	0.038	-3.631	0.000**
	Female	4.098	0.7631				
Item 3	Male	3.335	0.8455	4.899	0.027	-0.117	0.907
	Female	3.340	0.7806				
Item 4	Male	3.505	0.8849	3.157	0.076	0.935	0.350
	Female	3.460	0.8072				
Item 5	Male	3.640	0.8240	0.606	0.436	-0.667	0.505
	Female	3.671	0.7965				
Item 6	Male	3.690	0.8801	4.107	0.043	-0.757	0.449
	Female	3.727	0.8322				
Item 7	Male	3.569	0.7771	0.920	0.338	-0.945	0.345
	Female	3.611	0.7667				
Item 8	Male	3.439	0.8468	2.296	0.130	-0.042	0.966
	Female	3.441	0.7929				
Item 9	Male	3.621	0.9012	0.181	0.670	2.705	0.007**
	Female	3.481	0.8964				
Item 10	Male	2.970	0.9426	3.185	0.075	3.436	0.001**
	Female	2.787	0.9130				
Total Scale	Male	3.4711	0.60169	2.067	0.151	0.938	0.348
	Female	3.4397	0.55910				

* $p \leq 0.05$; ** $p \leq 0.01$

To analyse the relationship between eHealth literacy levels and age, the participants were divided into two age groups, having as a criterion the mathematical division in two sets of dimensions which are as similar as possible. The first group comprised participants aged up to 16 years (725 participants, 59.67%) and the second group included participants aged 17 and above (490 participants, 40.33%). After analysing the differences between them (student's t-test), no statistically significant differences were found ($p > 0.05$) neither in the items nor in the total score of eHealth literacy. An analysis was also performed taking into account the correlation between the age and the

results obtained in each item, as well as with the total score of eHealth literacy (Pearson's correlation test). Once again, no correlation was found between the age and the answers given to each item.

Statistically significant differences were also found ($p = 0.026$) between the participants in the three grade levels in the answers to item 4 "I know where to find helpful health resources on the Internet." (one-way *Anova* test). These differences were statistically significant between the 10th and the 12th grades, with higher mean scores in the answers given by 10th graders (Table 6).

Table 6
Differences between grade levels in item 4 (Tukey's Test)

a)	b)	\bar{x} a)	σ a)	\bar{x} b)	σ b)	Difference of \bar{x} (a-b)	p
10th grade	11th grade	3.571	0.8230	3.450	0.8499	0.1215	0.082
	12th grade			3.417	0.8751	0.1545	0.037*
11th grade	10th grade	3.450	0.8499	3.571	0.8230	-0.1215	0.082
	12th grade			3.417	0.8751	0.0330	0.854
12th grade	10th grade	3.417	0.8751	3.571	0.8230	-0.1545	0.037*
	11th grade			3.450	0.8499	-0.0330	0.854

* $p \leq 0.05$; ** $p \leq 0.01$

Discussion

The eHealth Literacy Scale-Portuguese version shows good internal consistency, with valid items which allow for an adequate assessment of eHealth literacy among Portuguese adolescents. After analysis of the scale's internal consistency, none of the items is dispensable, if items are level. Internal consistency values were similar to the values obtained in the validation of the original scale; however, stronger and statistically very significant inter-item correlations were found. This study provides an opportunity for using the scale with a total score and two dimensions: one dimension covers more aspects related to the search of information, based on data from a first factor with items 3, 4, 5, and 6; and another dimension related to the ability to use the information, corresponding to a second factor with data from items 7, 8, 9 and 10. The eHealth literacy levels in this sample ($\bar{x} = 3.4563$; $\sigma = 0.582$) do not seem to differ much from the levels found in other similar samples from studies in other countries (Drossaert et al., 2011; Ghaddar et al., 2012; Hove et al., 2011; Norman & Skinner, 2006; Paek

& Hove, 2012), and the ones found in this group are considered good.

Boys reported feeling more confident in using the Internet to make health-related decisions, while also mentioning that they can distinguish high quality resources from poor quality resources better than girls. Females showed higher scores in relation to the importance of being able to access health resources on the Internet. Despite the differences in some items, as well as the mathematical differences in the levels of eHealth literacy between genders, no statistically significant differences were found between them. T, which is not in line with the results of Norman and Skinner (2006a), who found higher levels of eHealth literacy in boys.

Despite the mathematical differences, age does not seem to be a determining factor in the levels of eHealth literacy, as had already been demonstrated by Drossaert et al. (2011) and Norman and Skinner (2006a). Only one item *I know where to find helpful health resources on the Internet.* showed statistically significant differences in relation to grade levels. The same was not true for the level of eHealth

literacy. Drossaert et al. (2011) and Ghaddar et al. (2012) mention that they found higher levels of eHealth literacy in students in higher grade levels. In relation to the item with statistically significant differences according to the grade level, it was observed that its value decreases with an increase in the grade level. This could be due to what Hove et al. (2011) refers to as the lack of trust in certain sites and difficulty in assessing the credibility of information. Thus, young people with more knowledge are less confident in the skills related to the search for eHealth information. They express more doubts about their ability, which can be confirmed by the lower eHealth literacy levels, or, in this case, in the perception about where to find useful information on health. The major limitation of this study is that the results cannot be generalized to the population of Portuguese adolescents.

Conclusion

The eHealth Literacy Scale - Portuguese version (translated and validated by the authors) has good psychometric properties, confirming the possibility of its use with a total score and two dimensions: search for information and use of information. Its application in different samples and contexts that allow for the generalization of results will confirm its feasibility and sensitivity to assess this concept among Portuguese adolescents.

The selected sample presents quite satisfactory eHealth literacy levels. Gender differences were found, but the levels of eHealth literacy were the same according to age. Students in higher grade levels have more doubts about where to find useful eHealth information. We agree with the various authors referred to in the theoretical background section, who argue that the intervention in young people as a way to promote their eHealth literacy skills will not only provide them with knowledge to search, assess, select, and use online health information, but also an increase their trust in this process. Including eHealth literacy in school health education programmes for adolescents may prove to be an important strategy for the promotion of health in this population, as well as the promotion of skills for the future.

References

- Austin, R. (2012). EHealth literacy for older adults - Part I. *Ania-Caring Newsletter*, 27(1), 7-9.
- Bodie, G. D., & Dutta, M. J. (2008). Understanding health literacy for strategic health marketing: EHealth literacy, health disparities, and the digital divide. *Health Marketing Quarterly*, 25(1/2), 175-203. doi:10.1080/07359680802126301
- Chan, C. V., Matthews, L. A., & Kaufman, D. R. (2009). A taxonomy characterizing complexity of consumer eHealth literacy. In *AMIA Annual Symposium Proceedings* (pp. 86-90).
- Drossaert, C. H. C., Van Der Vaart, R., & Van Deursen, A. J. A. M. (2011). Does the eHealth Literacy Scale (eHEALS) measure what it intends to measure? Validation of a Dutch version of the eHEALS in two adult populations. *Journal of Medical Internet Research*, 13(4), e86. doi:10.2196/jmir.1840
- Ghaddar, S. F., Valerio, M. A., Garcia, C. M., & Hansen, L. (2012). Adolescent health literacy: The importance of credible sources for online health information. *Journal of School Health*, 82(1), 28-36. doi:10.1111/j.1746-1561.2011.00664.x
- Gray, N. J., Klein, J. D., Noyce, P. R., Sesselberg, T. S., & Cantrill, J. A. (2005). The internet: A window on adolescent health literacy. *Journal of Adolescent Health*, 37(3), 243.e1-243.e7. doi:10.1016/j.jadohealth.2004.08.023
- Hove, T., Paek, H.-J., & Isaacson, T. (2011). Using adolescent eHealth literacy to weigh trust in commercial web sites. *Journal of Advertising Research*, 51(3), 524-537.
- Loureiro, L. M. J., Mendes, A. M. O. C., Barroso, T. M. M. D. A., Santos, J. C. P., Oliveira, R. A., & Ferreira, R. O. (2012). Literacia em saúde mental de adolescentes e jovens: Conceitos e desafios. *Revista de Enfermagem Referência*, 3(6), 157-166. doi:10.12707/RIII11112
- Ministério da Saúde. Direção Geral de Saúde. (2012). *Plano Nacional de Saúde 2012-2016: 3.1. Eixo estratégico: Cidadania em saúde*. Retrieved from http://pns.dgs.pt/files/2012/02/99_3_1_Cidadania_em_Sa%C3%BAde_2013_01_17_.pdf
- Norman, C. D., & Skinner, H. A. (2006a). eHEALS: The eHealth literacy scale. *Journal of Medical Internet Research*, 8(4), e27.
- Norman, C. D., & Skinner, H. A. (2006b). eHealth literacy: Essential skills for consumer health in a networked world. *Journal of Medical Internet Research*, 8(2), e9. doi:10.2196/jmir8.2.e9
- Paek, H.-J., & Hove, T. (2012). Social cognitive factors and perceived social influences that improve adolescent eHealth literacy. *Health Communication*, 27(8), 727-737. doi:10.1080/10410236.2011.616627

- Robinson, C., & Graham, J. (2010). Perceived internet health literacy of HIV-positive people through the provision of a computer and internet health education intervention. *Health Information and Libraries Journal*, 27(4), 295-303. doi:10.1111/j.1471-1842.2010.00898.x
- Sousa, V. D., & Rojjanasirak, W. (2010). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. *Journal of Evaluation in Clinical Practice*, 17(2), 268-274. doi:10.1111/j.1365-2753.2010.01434.x
- Stellefson, M., Hanik, B., Chaney, B., Chaney, D., Tennant, B., & Chavarria, E. A. (2011). eHealth literacy among college students: A systematic review with implications for eHealth education. *Journal of Medical Internet Research*, 13(4), e102. doi:10.2196/jmir.1703
- Sousa, V. D., & Rojjanasirak, W. (2010). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: A clear and user-friendly guideline. *Journal of Evaluation in Clinical Practice*, 17(2), 268-274.
- Stellefson, M., Hanik, B., Chaney, B., Chaney, D., Tennant, B., & Chavarria, E. A. (2011). eHealth literacy among college students: A systematic review with implications for eHealth education. *Journal of Medical Internet Research*, 13(4), e102.